Office of Energy Efficiency and Renewable Energy

Lower-Cost Carbon Fiber

Background

The lightest materials for making automotive structures are carbon fiber composites (CFCs), which can reduce body and chassis weight by more than 60%. However, CFCs are more expensive to produce than traditional materials. Raw materials for CFCs account for 45-60% of production costs, and capital equipment represents 25-40%. The price of CFCs must be reduced for large-scale use by the automotive industry.

The U.S. Department of Energy's (DOE's) Office of Advanced Automotive Technologies (OAAT), with domestic automotive manufacturers, carbon fiber suppliers, national laboratories, and universities, is working to reduce the cost of CFCs for high-volume applications. OAAT's program addresses methods to reduce material cost, initial fiber preconditioning, and high-temperature processing. Oak Ridge National Laboratory is examining the use of microwave energy to manufacture low-cost, high-quality carbon fibers.

Accomplishments

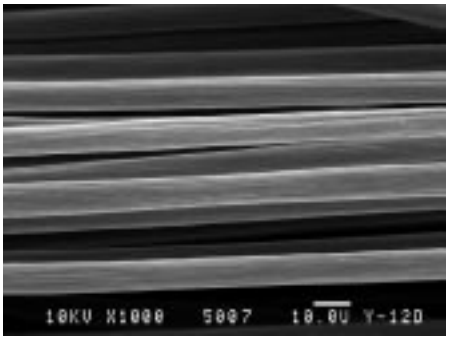
- This microwave technology produces fibers with densities, electrical resistivities, fiber diameters, and tow areas comparable to those made by conventional processes.
- Microwave processing times are 5-8 minutes compared with conventional processing times of 40-90 minutes.
- This technology can replace 70-90% of the conventional processing line, which accounts for 25-40% of processing costs. This process alone could yield a 20% reduction in carbon fiber price.

Benefits

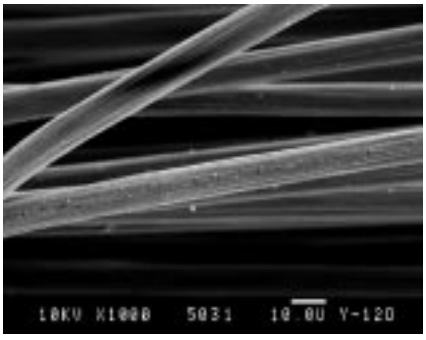
- Allow development of ultralightweight, affordable automotive structures that will reduce emissions and fuel consumption while preserving safety and affordability.
- Establish U.S. industry leadership and secure future jobs by early use of the next generation of advanced materials.

Future Activities

- Complete design, durability, joining, and safety research to explore the full potential of this material.
- Identify low-cost precursors as alternatives to conventional materials. Potential candidates include recycled materials, organic materials, low-cost polymers, and coal-derived products. Use of these materials could reduce the cost of precursors to $0.20-$1.20 per pound, making carbon fibers affordable for use by the domestic automotive industry.



Carbon Fibers Produced by Conventional Methods



Carbon Fibers Produced by Microwave Methods

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